THURSDAY, JUNE 27, 1907.

RESINS.

Die Harze und die Harzbehälter mit Einschluss der Milchsäfte. By A. Tschirch. Zweite stark erweiterte Auflage. Erster und zweiter Band. Pp. xxii+1268. (Leipzig: Gebrüder Bornträger, 1906.) Price 32 marks.

The Distillation of Resins By Victor Schweizer. Pp. viii+183. (London: Maclaren and Sons; New York: Van Nostrand and Company, n.d.) Price 10s. 6*d.*

THE chemistry of resins has been very much neglected by investigators, so much so that even now the empirical formula of the best known of their constituents—abietic acid, which was isolated from ordinary rosin more than eighty years ago—is still a matter of dispute. It is difficult to account for this neglect, since many of the naturally occurring resins are readily resolved into crystalline or otherwise well-defined substances, so that the subject does not present the initial difficulties encountered by the investigators who have studied the terpenes, proteids, and similar intractable natural products. Resins should now be particularly attractive to chemical workers, since Prof. Tschirch and his collaborators have surveyed almost the whole field in a preliminary manner, and from their results it is possible to select the most promising materials for detailed investigation.

Perhaps the most important result which has accrued from this work is the possibility of classifying the constituents of the natural resins into a comparatively small number of groups of similarly reacting—and probably similarly constituted—substances. Looked at from this general point of view, the chemical work done by Prof. Tschirch and his coadjutors can be regarded as a very satisfactory contribution to our knowledge of resin chemistry.

The publication of the second edition of this monograph affords an opportunity for a review of this work as a whole, since the book is largely a reprint, with additions and corrections, of papers published in the *Archiv der Pharmazie.*

Prof. Tschirch's usual method of investigation consists in dissolving the resin under examination in an indifferent solvent, and extracting this successively with solutions of alkali carbonates and hydroxides.

The products so isolated, and perhaps subjected to a more or less satisfactory process of purification, are in general regarded as definite substances, and though they are in the majority of cases amorphous coloured products having no constants which may be regarded safely as criteria of purity, they are analysed and have names and formulæ assigned to them. The qualifying statement that such substances may be impure is no adequate defence for such a proceeding, since the names and formulæ are liable to be copied into the literature of the subject without the disclaimer which originally accompanied them.

Similarly, when Prof. Tschirch in the course of an investigation meets with a substance resembling one already known, he does not in general ascertain definitely whether the two substances are identical, but, assuming that they are probably distinct, makes a denominator for his supposed new substance by attaching a descriptive prefix to the name of the older compound; thus *palabietic acid,* from the resin of *Pinus palustris,* has the same elementary composition and melting point as abietic acid, with which, so far as one can see, it may be identical.

The application of the terms "resinolic acid" and "resene" is also objectionable. The first of these would, under any system of nomenclature now in use among chemists, imply the presence of a hydroxyl in addition to a carboxyl group in each of the substances included in the class so designated, and similarly the termination -ene is usually reserved for hydrocarbons. Prof. Tschirch's "resinolic acids" are simple carboxylic acids, typified by abietic acid, and his "resenes" are oxygenated substances.

The book is not only a record of the results of chemical investigations, but deals with the botany and habitats of the plants from which resins are obtained, and to these branches of knowledge the author and his collaborators have made many and important contributions. Much of the information given is the result of personal observations made by Prof. Tschirch during travels in the East Indies and elsewhere, and probably no previous investigator of plant products has devoted more care to securing authentic material for investigation. The botanical part of the subject is dealt with in the second and smaller volume, which gives a *résumé* of our present knowledge of the mode of origin and distribution of resins in plants. Reference should also be made to the important section dealing with latices and the resins and rubbers obtained from them, matters which are at the present moment of great economic importance.

There are a few resinous products which have been the subject of investigation, and which, in spite of Prof. Tschirch's desire to make his monograph as complete as possible, have escaped his notice, but these are for the most part of little importance.

In spite of those unfortunate tendencies to add unduly to nomenclature and to be somewhat lax in awarding the character of a definite substance to ill-defined amorphous products, to which attention has been directed, this book is a welcome addition to the rather scanty literature dealing with the chemistry and botany of vegetable products.

Mr. Schweizer's book is intended primarily for the "practical man," and is consequently of little interest from the purely scientific point of view. The descriptions of processes and plant for the distillation of rosin and the rectification of the products obtained are lucid, and their value is enhanced by the well-printed illustrations of distilling and other apparatus, made in several instances from the author's designs.

The chapters dealing with the manufacture and uses of resinates, the preparation of lampblack, and the methods of making printing and other lampblack inks are of special interest, since much of the information given was not accessible previously.

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In the first line of p. 22 "position" is obviously a misprint for "composition," and there are a considerable number of such slips throughout the work.

A fairly full "contents list" is given, but the book would have been more useful if a comprehensive index had been provided.

T. A. H.

THE WORKS OF C. F. GAUSS.

Carl Friedrich Gauss Werke. Siebenter Band. Herausgegeben von der Kön. Gesellschaft der Wissenschaften zu Göttingen. Pp. 650. (Leipzig: B. G. Teubner, 1906.) Price 30 marks.

Dreyer

THIS volume contains a reprint of Gauss's principal astronomical work, the "Theoria Motus Corporum Cœlestium," and his unpublished researches on planetary perturbations and on the lunar theory. In 18[illegible]1 the late Prof. Schering brought out a "volume vii." without the cooperation of the Göttingen Academy of Science, containing the "Theoria Motus" and some notes from Gauss's papers; but for the sake of uniformity the academy considered it desirable to include the "Theoria" in the present volume, which has been edited by Prof. Brendel, of Göttingen.

A careful revision of the original edition of 1809 brought a few corrections to light, and a re-computation of the examples with modern tables of logarithms revealed a number of errors of one or two units of the seventh decimal (caused probably by the absence of decimals in the proportional parts of the old tables) which sometimes gave rise to greater errors in the course of the computation. A list of these corrections is given. Some notes found in Gauss's own copy of the book are added in footnotes. Next follow various notes on elliptic and parabolic motion, partly already published, partly extracted from letters and note-books. Of these the most important is a table for computing the true anomaly in a parabolic orbit; it was to have formed part of a supplement to the "Theoria Motus," dealing with the orbits of comets, which never was written.

The discovery of the first of the minor planets, Ceres, had obliged Gauss to work out a general method of computing an elliptic orbit. The next step was to determine the perturbations of the motion of Ceres and Pallas, which, particularly in the case of the latter, necessitated new methods owing to the great eccentricity and inclination; and on this work Gauss spent a great deal of time in the years 1802 to 1817. In 1805 he worked out a new method of computing the general perturbations by the variation of the elements, but he never published anything on the subject. The method is essentially the same as that proposed by Hansen in 1843 in his paper on absolute perturbations in orbits of any eccentricity and inclination.

The present volume first gives letters and computations on Ceres, after which follow 200 pages devoted to Pallas. Special perturbations by Jupiter for the years 1803–1811 were computed in 1810 and 1811, first for intervals of fifty days, after which the work was repeated with periods of 500 days, the elements for each period being taken from the first computation. The memoir on the theory of general perturbations was written in French, about the year 1815, apparently in answer to a prize question of the Paris Academy, but never finished. In 1811 Gauss began the immense labour of computing the action of Jupiter on Pallas, and finally, with the aid of Encke and Westphal, completed the work by the preparation of tables. The perturbations by Saturn were computed by Nicolai, and this work is preserved at the Heidelberg Observatory; it has naturally not been included in the present volume, but hopes are held out that it may be published elsewhere. Finally, the last part of the whole work, the action of Mars, was taken in hand, but owing to the press of other work it was never completed. It is much to be regretted that this fine piece of work, involving an enormous amount of computation, has been unknown until now, and that not even so interesting a result as the increase of the assumed mass of Jupiter was published. Already in 1814 Gauss found from the first nine oppositions of Pallas that Laplace's value, 1 : 1067·09, should be increased to 1 : 1042·86, a result which differs but little from the most recent determinations. If known to Encke, this correction of the mass would have prevented the errors of 5′ in the computed geocentric places in 1834, caused by the near approach to Jupiter in 1832 (*Astr. Nachr.*, No. 332). Needless to say, the remarkable commensurability of the mean motions of Jupiter and Pallas was noticed by Gauss at an early date.

It appears from letters written to Hansen and Bessel in 1843 that Gauss bitterly regretted having laid this great work aside. Thanks to the skilful editorship of Prof. Brendel, whose task of arranging and interpreting a vast mass of papers must have been a very difficult one, the work is now accessible in a clear and convenient form, and it is to be hoped that some competent hand will complete it.

Lastly, the volume contains the beginning of a lunar theory, dating from the second half of 1801, but soon abandoned, probably because vol. iii. of Laplace's "Mécanique Céleste" came out in the following year, and seemed to make work on the motion of the moon unnecessary at that moment. The form in which the perturbations are given is similar to that of Plana (1832).

Vols. viii. and ix. of the collected works of Gauss have already appeared. A tenth and concluding volume is announced, which is to include a general index.

J. L. E. D.

NATURE AND FLORAL DESIGN.

Flowers and Plants for Designers and Schools. By Henry Irving and E. F. Strange. Pp. 95. (London: Hodder and Stoughton, 1907.) Price 10*s.* 6*d.* net.

Walter Crane

IF designers could be produced by the study of books upon plant form there ought to be a large and flourishing crop of them, since so many elaborate works have appeared on this subject addressed to the supposed needs of such artists.

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